Instruction begins in the first year with examination of the eye and a lecture on various aspects of ocular disease. During the second year, students will receive a refresher lecture and lab on direct ophthalmoscopy as well as a lecture on ophthalmic manifestations of systemic disease and primary ocular disease. During the third year, students are given the opportunity during the surgery clerkship to spend four weeks on the ophthalmology services. In addition, during the third year there are lectures given to students during the Internal Medicine rotations. In the fourth year, a four-week intensive clinical rotation is tailored to students interested in pursuing ophthalmology as a career. Also, research electives are available under the guidance of numerous ophthalmology faculty members for fourth-year students.

Website: [http://ophthalmology.wustl.edu](http://ophthalmology.wustl.edu)

Degrees & Requirements

While the Department of Ophthalmology and Visual Sciences does not offer its own degree, some of the department’s courses are open to students in the MD and MSTP (MD/PhD) programs. Further information about the MD and MSTP degrees can be found in the Degrees & Programs Offered ([http://bulletin.wustl.edu/medicine/degrees](http://bulletin.wustl.edu/medicine/degrees)) section of this Bulletin.

Research

**M50 Ophthalmology 900**

**Usha P. Andley, PhD**  
1114-C McMillan  
Phone: 314-362-7167  
Molecular basis of cataract; the function of molecular chaperones in cataract; proteomics, imaging and biochemical studies on cell culture and mouse models for crystallin gene mutations linked with cataract; testing drugs to inhibit cataract.

**Rajendra S. Apte, MD, PhD**  
Email: apte@vision.wustl.edu  
Innate immunity and immune effector mechanisms in the retina, oxidative stress and cell death, models of developmental angiogenesis and neovascularization, inflammation and photoreceptor survival, macular degeneration.

**Steven Bassnett, PhD**  
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Phone: 314-362-1604  
Eye development, stochastic models of lens growth, stem cell biology, age-related cataract, UV-induced somatic mutation, ocular manifestations of Marfan syndrome, cell death suppression on the optic axis, cell biology of transparent tissues.

**Anjali Bhorade, MD**  
Phone: 314-362-5343  
Evaluating the effect of glaucoma on visual function in older adults in the home. Understanding the relationship between vision and driving in older adults with glaucoma.

**Shiming Chen, PhD**  
618 McMillan  
Phone: 314-747-4350  
The molecular mechanisms regulating photoreceptor gene expression and the implications in understanding photoreceptor development and disease. We are focusing on three transcription factors, CRX, NRL and NR2E3, linked to photoreceptor degenerative diseases. Molecular genetics and biochemical approaches are used to identify the regulatory pathways associated with each factor. Mouse models are used to understand why mutations in these factors cause disease and develop therapeutic strategies, including AAV-gene therapy.

**Steven M. Couch, MD**  
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Orbital inflammatory diseases, surgical techniques and novel treatments of periocular/orbital disease.

**Susan M. Culican, MD, PhD**  
1104 McMillan  
Phone: 314-362-9278  
Clinical: development of a low-cost, simple visual function task for screening for macular disorders in the primary care setting. Education: examination of the utility of assessment tools for evaluating resident clinical progression during residency training. Development of new metrics to gauge resident progress.

**Philip L. Custer, MD**  
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**Thomas A. Ferguson, PhD**  
1207 McMillan  
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Molecular basis of immune tolerance and how apoptotic cells tolerate the immune response. The role of immune privilege in the pathogenesis of eye diseases such as age-related macular degeneration (AMD). The role of basal autophagy in the cells of the eye by using the cre-loxP system to delete essential autophagy genes from specific cell types in the eye.

**Mae Gordon, PhD**  
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Ocular hypertension, glaucoma, keratoconus, adenoviral conjunctivitis, randomized clinical trial methodology, patient-reported outcome measures and measurement reliability.
George J. Harocopos, MD
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Age-related cataract, ophthalmic pathology.

Didier Hodzic, PhD
620 McMillan
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Email: hodzicd@vision.wustl.edu
Cell biology of retinal development and homeostasis in mice, cone and rods cytoarchitecture.

Andrew Huang, MD, MPH
106 McMillan
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Ocular surface stem cell biology, molecular therapy for corneal dystrophies and corneal neovascularization, oxidative stress of corneal endothelium, clinical research on dry eye and ocular surface disease.

Humeyra Karacal, MD
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Treatment of uveitis, prevention of cataracts with anti-oxidants, anti-oxidants in age-related macular degeneration, retinal imaging and analysis using data mining techniques, designing OR equipment to facilitate ophthalmic surgery.

Michael A. Kass, MD
Email: kass@vision.wustl.edu
Principal Investigator of the Ocular Hypertension Treatment Study (OHTS). Diagnosis, treatment and public health aspects of glaucoma.

Vladimir Kefalov, PhD
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Photoreceptor Neurobiology and Retinal Degeneration. We are a sensory neurobiology lab interested in the function of mammalian rod and cone photoreceptors. In addition, we are interested in the mechanisms of neurodegeneration in the retina and are working on developing pharmacological and gene-therapy tools for preventing photoreceptor cell death.

Daniel Kerschensteiner, MD
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To understand the principles that guide the assembly of neural circuits and to decipher the way they process information. We would like to understand the principles that guide the assembly of neural circuits in the retina and to decipher the way they process information and hope to identify features of the retinal circuit architecture that perform particular computations and characterize how they arise during development. We then probe underlying mechanisms of circuit assembly and function through genetically targeted manipulations of specific cells in the retina.

John T. Lind, MD, MS
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Glaucoma education, resident education, pharmacologic and surgical treatment of glaucoma, ophthalmic microbiology.

Gregg T. Lueder, MD
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Retinoblastoma, eye misalignment (strabismus), retinopathy of prematurity, abnormal tearing, nasolacrinal disorders, cataracts, glaucoma.

Peter Lukasiewicz, PhD
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Neurotransmitters, synapses, retinal function in health and disease, retinal information processing.

Todd P. Margolis, MD, PhD
Email: margolist@vision.wustl.edu
1. Cellular and molecular mechanisms that regulate herpes simplex infection neurons.
2. Inexpensive telemedicine for reducing blindness in underserved populations.

John R. Pruett Jr., MD, PhD
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Visual Systems and Cognitive Neuroscience Studies of Autism. Two active areas of research in my lab include: 1) behavioral and imaging studies of visual attention to and processing of eyes and faces in autistic and non-autistic subjects, and 2) developmental studies of large-scale brain networks in autistic and non-autistic subjects using functional connectivity magnetic resonance imaging (fMRI). Example research rotation projects might include: pilot visual psychophysical studies of intermediate visual processes supporting face perception or — for trainees with computational and/or imaging skills and interests — graph theory-based analyses of visual system subnetwork structure across various groups in fMRI data we have acquired from ongoing projects.

Kumar Rao, MD
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Surgical and medical therapies for disorders of retina and choroid.

Nathan Ravi, MD, PhD, MS, FAAO
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Directed toward understanding the pathophysiology of presbyopia and developing medical or surgical treatments for this condition.

Alan Shiel, PhD
1128 McMillan
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Molecular genetic mechanisms underlying cataract, glaucoma and associated eye disorders: (1) genome-wide linkage analysis and targeted (exome, amplicon) sequencing for discovery of causative or susceptibility genes, and (2) genotype-phenotype and functional expression studies of naturally occurring and
gene-targeted mouse models to characterize pathogenic mechanisms.

Carla J. Siegfried, MD
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My research is focused on ocular oxygen metabolism and the development of open-angle glaucoma. We are studying how the oxygen gradient in the eye is altered in disease states as well as noninvasive methods of measuring corneal oxygen consumption.

Florentina Soto, PhD
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Studies in my laboratory aim to identify the molecular basis of dendrites and axons lamination and synapse formation during development and in the adult retina. In addition, we investigate how these molecules could be involved in the development of retinal pathologies including retinal degeneration.

Larry Tychsen, MD
2S89 Eye Clinic, St. Louis Children's Hospital
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Principal investigator on NIH-funded studies of visual brain maldevelopment and repair in infant primates, as well as clinical studies of visuomotor abnormalities in cerebral palsy and pediatric refractive surgery.

Gregory P. Van Stavern, MD
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Neuroimaging of the visual pathways, Idiopathic Intracranial Hypertension, evidence-based medicine and clinical decision making; using the visual system as a model to study neurologic disorders. A further description of research labs can be found on the Vision Research Community website (http://vrcore.wustl.edu/residentstudentresearchopportunities/RSROHome).

Faculty

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Adult Ophthalmology Clinical Director
P. Kumar Rao

Ophthalmology Research Director
Peter Lukasiewicz

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Susan Culican

Ophthalmology Director of Translational Research
Rajendra Apte

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OD School Not Listed 1954

Brian Patrick Sumner, OD
Adjunct Instructor in Ophthalmology and Visual Sciences (primary appointment)
OD Illinois College of Optometry 1978

Paul M Tesser, MD, PHD
Associate Professor of Clinical Ophthalmology and Visual Sciences (primary appointment)
BS Mass Inst of Technology (MIT) 1981
MD State Univ of NY Stonybrook 1991
PHD State Univ of NY Stonybrook 1990

Matthew A Thomas, MD
Professor of Clinical Ophthalmology and Visual Sciences (primary appointment)
BS Harvard University 1977
MD Harvard University 1991

Linda Mei-Lin Tsai, MD
Associate Professor of Ophthalmology and Visual Sciences (primary appointment)
MD Northwestern University 1995
BA Northwestern University 1990

Robert Lawrence Tychsen, MD
Professor of Ophthalmology and Visual Sciences (primary appointment)
John F Hardesty MD Distinguished Professor of Ophthalmology and Visual Sciences
Professor of Neuroscience
Professor of Ophthalmology and Visual Sciences in Pediatrics
BS Georgetown University 1975
MD Georgetown University 1979

Gregory Paul Van Stavern, MD
Professor of Ophthalmology and Visual Sciences (primary appointment)
Professor of Neurology
MD Pennsylvania State University 1993
BS La Salle University 1989

Gary Lee Vogel, OD
Adjunct Instructor in Ophthalmology and Visual Sciences (primary appointment)
BA University of Iowa 1970
OD Ohio State University 1977

David Edward Vollman, MD
Assistant Professor of Ophthalmology and Visual Sciences (primary appointment)
MD Ohio State University 2006

James J Wachter, OD
Adjunct Instructor in Ophthalmology and Visual Sciences (primary appointment)
BS Illinois College of Optometry 1990
BA Saint Louis University 1987
OD Illinois College of Optometry 1991

Donald E Walter Jr, OD
Adjunct Instructor in Ophthalmology and Visual Sciences (primary appointment)
OD University of Houston 1972
BS University of Houston 1971

William Lee Walter, MD
Assistant Professor of Clinical Ophthalmology and Visual Sciences (primary appointment)
BA De Paul University 1950
MD Ohio State University 1954

Stephen R Waltman, MD, MBA
Professor of Clinical Ophthalmology and Visual Sciences (primary appointment)
BS Mass Inst of Technology (MIT) 1961
MD Yale University 1964

Stephen Alan Wexler, MD
Professor of Clinical Ophthalmology and Visual Sciences (primary appointment)
MD University of Michigan 1982
BS University of Michigan 1977

Richard Harris Wieder, MD
Associate Professor of Ophthalmology and Visual Sciences (primary appointment)
BS University of Illinois 1982
MD University of Illinois 1986

Michael L Wolf, OD
Adjunct Instructor in Ophthalmology and Visual Sciences (primary appointment)
OD University of Missouri 1987
BS University of Missouri 1979

Ming-Fong Agnes Wong, MD, PHD
Adjunct Professor of Ophthalmology and Visual Sciences (primary appointment)
MD McGill University 1994
PHD University of Toronto 2001
BA Boston University 1990

Courses
Curriculum courses for Ophthalmology and Visual Sciences are listed below (p. 12).


First Year
Introduction to clinical ophthalmology begins in the first year with a lecture and practicum (peer exam) on taking an ocular history and performing an ocular exam. Emphasis is on ophthalmoscopy. Lectures and practicum session will be led by Dr. John Lind and Dr. Morton Smith.

Second Year
During the second year, students will receive a refresher lecture and lab on direct ophthalmoscopy as well as a lecture on ophthalmic manifestations of systemic disease and primary ocular diseases.

Third Year
Third-Year Clerkship Opportunities
In the third year, students are given the opportunity to spend four weeks of their surgery rotation on the ophthalmology service. The students work closely with the ophthalmology residents and review the differential diagnosis of the "red eye," how to interpret an ophthalmologic consult note, and how to handle ocular emergencies. During this rotation, there is again emphasis on the use of the ophthalmoscope. Additional clinical skills introduced to student rotators include the use of the slit lamp and indirect ophthalmoscopy. All third-year students must complete the "Case Studies in Ophthalmology for Medical Students" and attend the periodic "feedback/oral exam" session with Dr. John Lind and/or Dr. Morton Smith.

Third Year/Fourth Year
Ophthalmology Sub-Internship Rotation ("The Sub-Eye"). During the month of June prior to fourth year, students interested in pursuing a career in ophthalmology are encouraged to rotate on this intensive four-week rotation. Students will have personal indirect ophthalmoscopy lenses available for use on the rotation. Formal didactics and workshops will be used to teach students how to perform a detailed ophthalmic history and exam including mastery of advanced slit lamp techniques and indirect fundoscopy. There will be an intense schedule of both live and recorded lectures delivered by ophthalmology faculty members with post-lecture quizzes. Students will be expected to perform daily required reading. Retention and understanding of reading materials will be gauged by frequent quizzes. Students are strongly encouraged to present a case at the department's Grand Rounds. By the end of the rotation, students will be expected to function at the level of a first-year ophthalmology resident.

Curriculum Courses
M50 Ophth 655A Ophthalmology
This course provides an introduction to clinical ophthalmology with emphasis on the history and physical examination specific for diseases of the eye. Common ocular diseases, ocular manifestations of systemic disease and ocular emergencies are reviewed.
Credit 3 units.

M50 Ophth 740 Ophthalmology Clerkship
In the third year, students are given the opportunity to spend four weeks of their surgery rotation on the ophthalmology service. At least two weeks are spent in the general ophthalmology clinic and the remaining two weeks are spent in sub-specialty clinics of neuro-ophthalmology, pediatric ophthalmology, glaucoma, cornea and external disease or retina in the outpatient eye clinic examining patients with ophthalmology residents. The students work closely with the ophthalmology residents
and review the differential diagnosis of the "red eye," how to interpret an ophthalmologic consult note, how to handle an ocular emergency in the emergency room (chemical burns, etc.) During this rotation, there is again emphasis on the use of the ophthalmoscope and a comprehensive text is used by the students during the rotation.

Credit 38.5 units.

M50 Ophth 801 Ophthalmology
This elective is for senior students who plan to apply for a residency in Ophthalmology. In accordance with any sub-internship, medical students will be expected to function at the level of a beginning first-year ophthalmology resident on this rotation. The students will rotate through the resident eye clinic and the subspecialty clinics of the full time faculty of the Washington University Medical School Department of Ophthalmology and Visual Sciences (e.g., neuro-ophthalmology service, cornea/external disease service, etc.). The first day of the rotation will consist of an orientation day in which students will receive extensive didactics and participate in workshops to learn the basics of a complete ophthalmic history and examination. Students may opt to check-out indirect ophthalmoscopy lenses that may be used for the month to facilitate the acquisition of fundoscopy skills. During the rotation, the student's responsibilities range from observation (including observing surgery) to working at a resident level and completing full eye examinations. There will be a rigorous academic curriculum for the rotation including a weekly case presentation, bi-monthly wet lab sessions with a resident, weekly attendance at grand rounds, and a mix of medical student-oriented and resident-oriented conferences. On day one, students will receive a rotating call schedule for the entire month. A medical student is expected to be present at all times to assist the primary call ophthalmology resident during the rotation. By the end of the four-week rotation, the student is expected to be proficient in taking an ocular history and performing a complete eye exam including slit lamp biomicroscopy and indirect ophthalmoscopy.

M50 Ophth 816 Away Rotation in Ophthalmology
This four-week elective is for senior students from medical schools across the United States who are in good standing at their home institution and who are planning to apply for a residency in ophthalmology. The students will rotate through the resident eye clinic and the subspecialty clinics of the full time faculty of the Washington University Medical School Department of Ophthalmology and Visual Sciences (e.g., neuro-ophthalmology service, cornea/external disease service, etc.). In exchange for a refundable deposit, students may opt to check-out indirect ophthalmoscopy lenses that may be used for the month to facilitate the acquisition of fundoscopy skills. During the rotation the student's responsibilities range from observation (including observing surgery) to working at a resident level and completing full eye examinations. Didactics will include weekly case presentation sessions to Dr. John Lind or Dr. Morton Smith, weekly attendance at grand rounds, and a mix of medical student-oriented and resident-oriented conferences. Also, there will be medical student-oriented workshops to learn the basics of the slit lamp and indirect ophthalmoscopy. On day one, students will receive a schedule of conferences that they are expected to attend during the month. By the end of the four-week rotation, the student is expected to be proficient in taking an ocular history and performing a complete eye exam including slit lamp biomicroscopy and indirect ophthalmoscopy. The final grade of the student is determined by the course director with input from the residents, fellows, and faculty members of the particular service(s) through which the student rotated.

M50 Ophth 900 Research Elective - Ophthalmology
Research opportunities may be available. If interested, please contact the Department of Ophthalmology.